

REMARKS


Applicants request entry of the above-identified amendments which conform the claims to U.S. practice. No new matter is being introduced by this Amendment as antecedent support is set forth in the specification and the original claims.

Prosecution on the merits is respectfully requested.

If there are any charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130 maintained by Applicants' attorneys.

Respectfully submitted,
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Version with Markings to Show Changes Made

Claims 1-4, 7-11 and 14-15 are amended herein as follows.

1. (Amended/Marked up) A layer-by-layer etching apparatus using a neutral beam, the layer-by-layer etching apparatus comprising:
a reaction chamber having a stage therein on which a substrate to be etched is mounted;
a neutral beam generator for generating a neutral beam from a source gas to supply the neutral beam into the reaction chamber;
a shutter [installed] disposed between the neutral beam generator and the reaction chamber, [the shutter] for controlling the supply of the neutral beam into the reaction chamber;
an etching gas supply for supplying an etching gas into the reaction chamber;
a purge gas supply for supplying a purge gas into the reaction chamber; and
a controller for controlling the supply of the source gas, the etching gas, and the purge gas and [the] opening and closing of the shutter.

2. (Amended/Marked up) The layer-by-layer etching apparatus of claim 1, wherein the neutral beam generator comprises:
an ion source for extracting an ion beam having a predetermined polarity from the source gas and accelerating the ion beam; and
a reflector positioned in [the] a path of [an] the ion beam accelerated from the ion source, [the reflector] for reflecting and neutralizing the ion beam.

3. (Amended/Marked up) The layer-by-layer etching apparatus of claim 2, wherein the reflector [is formed of] has a plate shape [which may be tilted to control an angle of incidence of an incident ion beam to the horizontal surface of the plate].

4. (Amended/Marked up) The layer-by-layer etching apparatus of claim 2, wherein the reflector [is formed of] comprises a plurality of [overlapped] co-centric cylindrical [reflectors] reflecting members and different polar voltages are applied to adjacent [reflectors] reflecting members [of the overlapped cylindrical reflectors].

7. (Amended/Marked up) The layer-by-layer etching apparatus of claim 1, wherein the substrate to be etched [is a substrate containing] contains silicon[, the neutral beam is an argon neutral beam, and the etching gas is a chlorine gas].

8. (Amended/Marked up) A layer-by-layer etching method using a neutral beam, [the layer-by-layer etching method] comprising:

(a) loading a substrate to be etched, on which a layer to be etched is exposed, on a stage in a reaction chamber;

(b) supplying an etching gas into the reaction chamber to adsorb the etching gas on [the] a surface of an exposed portion of the layer to be etched; and

[(c) removing excessive etching gas remaining after being adsorbed;]

[(d)] (c) irradiating a neutral beam on the layer to be etched on which the etching gas is adsorbed; and

(e) removing etch by-products generated by the irradiation of the neutral beam].

9. (Amended/Marked up) The layer-by-layer etching method of claim 8, wherein steps (b) [through] and [(e)] (c) form[s] one cycle which is repeatedly performed to etch the layer to be etched from the surface of the layer in a layer-by-layer manner.

10. (Amended/Marked up) The layer-by-layer etching method of claim 9, wherein a monoatomic layer distributed on the surface of the layer to be etched is etched by half whenever the cycle is performed one time.

11. (Amended/Marked up) The layer-by-layer etching method of claim 8, wherein in step [(d)] (c) acceleration energy of the neutral beam is controlled so that sputtering does not occur on the surface of the layer to be etched.

14. (Amended/Marked up) The layer-by-layer etching method of claim 8, [wherein steps (c) and (e) are performed using a nitrogen gas as a purge gas] further comprising removing excessive etching gas remaining before the step (c).

15. (Amended/Marked up) The layer-by-layer etching method of claim 8, wherein in step [(d)] (c), the neutral beam is irradiated from an ion source for extracting an ion beam having a predetermined polarity from a source gas and accelerating the ion beam and a neutral beam generator having a reflector which is positioned in a path of the ion beam accelerated from the ion source and reflects and neutralizes the ion beam.

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